CLAIMS

1. A method for attaching DNA in plasmid form to the surface of calcium phosphate ceramic or powder, characterized in that it comprises a step a) consisting of a hydration of the calcium phosphate powder or calcium phosphate ceramic in a phosphate buffer solution not saturated with calcium and phosphate and a step b) consisting of an immersion of the products obtained in step a) in a phosphate buffer solution not saturated with calcium and phosphate containing a single- or double-stranded DNA for periods varying from a few minutes to several hours, c) producing calcium phosphate particles containing DNA molecules attached to its surface.

2. The method as claimed in claim 1, characterized in that the solution in step a) and b) comprises a 0.12 M phosphate buffer (pH 6.8).

3. The method as claimed in claim 1, characterized in that the immersion is carried out for at least 1, 5, 10 or 30 minutes up to about 12, 24 or 48 hours at a temperature ranging from 15 to 50°C, preferably about 37°C.

4. The method as claimed in claim 1, characterized in that the calcium phosphate particles are kept immersed in a culture medium of the cell culture media type.

5. The method as claimed in claim 4, characterized in that the calcium phosphate particles are immersed for about a few minutes to a few days.

6. The method as claimed in one of claims 4 and 5, characterized in that the calcium phosphate particles are immersed at a temperature ranging from 15 to 50°C, preferably about 37°C.

7. The method as claimed in one of claims 1 to 6, characterized in that step b) is carried out by means of a medium simulating the extracellular fluids or a medium of the cell culture media type containing the nucleic acids, said medium being nondenaturing for the DNA and not saturated with calcium and phosphate; this medium causing epitaxial carbonated apatite growth at the surface of said powders and ceramics.

8. The method as claimed in one of claims 1 and 7, characterized in that steps a) and b) are carried out simultaneously or successively.

9. The use of the method as claimed in one of claims 7 and 8 to attach DNA under physiological pH conditions to calcium phosphate particles.

10. A method for transfecting isolated cells, cultured in a monolayer or in three dimensions, consisting of bringing the cells to be transfected into contact with the particles obtained by the method as claimed in one of claims 1 to 8 for periods of a few hours to a few weeks.

11. A method for transfecting cells contained in a cultured tissue fragment consisting in bringing the cells to be transfected into contact with the particles obtained by the method as claimed in one of claims 1 to 8 for periods of a few hours to a few weeks.

12. The use of the particles obtained by the method as

claimed in one of claims 1 to 8 for the preparation of a medicament for transfecting in vivo cells contained in a tissue or in an organ.

13. A calcium phosphate ceramic and powder which can be obtained from the method as claimed in one of claims 1 to 8, characterized in that it supports epitaxial carbonated apatite growth at its surface under nondenaturing conditions.

14. The calcium phosphate ceramic and powder as claimed in claim 13, additionally comprising nucleic acids attached to its surface.

15. The calcium phosphate ceramic and powder as claimed in claim 13 and 14, characterized in that it possesses at least one of the following properties:

- nature of the charged groups at the surface: PO_4^-, OH^-, Ca^{++}
- basic surface pH
- negative electrokinetic potential
- hydrophobic
- particle size between 0-200 µm, in particular between 80-125 µm and 0-25 µm.

16. The calcium phosphate ceramic and powder as claimed in one of claims 13 to 15, characterized in that it additionally comprises a core composed of another polymeric, ceramic or metallic, preferably magnetic, material.

17. A particle formed based on the calcium phosphate powder as claimed in one of claims 13 to 16, contained in a mineral or polymeric matrix, in particular in calcium phosphate or sulfate cements.

18. The use of the calcium phosphate powders and ceramics as claimed in one of claims 13 to 16, for the transfection of cells *in vitro*.

19. The use of the calcium phosphate ceramic and powder as claimed in one of claims 13 to 16, for the manufacture of a medicament for the transfection of cells *in vivo*.

20. The use of the calcium phosphate ceramic and powder as claimed in one of claims 13 to 16, for the culture of transfected cells in three dimensions with formation of a cellular or extracellular matrix aggregating the particles.